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MORPHOLOGIC AND CHEMICAL CHARACTERISTICS OF GOLD GRAINS: METHODOLOGIC IMPROVEMENTS FOR GOLD – BEARING DEPOSIT EXPLORATION IN ACTIVE CONTINENTAL MARGINS.

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INTRODUCTION

Different publications report that the morphological evolution of gold particles in stream sediments or soils during transport constitute an effective exploration tool for the determination of the distance to the gold-bearing source (Herail et al., 1999 a, b). In addition Palacios et al (1999 a,b) have shown that the composition of gold grains cores allows to discriminate between the more important gold-bearing ore deposits in the active continental margin setting: gold porphyries, gold – rich copper porphyries and epithermal mineralization.

The present day mining crisis compels to consider the development of great volume – low grade gold-bearing deposits, in order to use the comparative advantage of copper porphyry operations. According to this economic background, Palacios et al. (1999 c) have proposed an exploration geochemical methodology which allows determination of gold porphyry erosion level and thus an estimate of the remnant ore potential.

On the basis of these morphologic and chemical characteristics of gold grains, we propose a methodologic improvement in the exploration, of gold-bearing deposit in active continental margins.

THE METHODOLOGY

During the early stage of grass-root gold exploration, hand-wash gold particles recovery is recommended by from Au anomalous stream sediments (up to 100 ppb in Au concentration, and up to 0.02 mm in size). These gold grains need to be classified using Table 1. After statistical determination, the study of 20 nuggets are sufficient for the estimation of the distance existing between the sample and the gold-bearing source.

Au-Ag-Cu ternary diagram, using microprobe analysis of the centre in the recovered gold nuggets, allows the discrimination between epithermal, gold porphyry and gold-rich porphyry copper deposits (Fig.1). This method seems to be an appropriate tool in order to obtain an indicator about the source type of gold-bearing hydrothermal deposit.

If the ore body corresponds to a porphyry gold deposit, the Cu concentration in gold crystals formed during the chlorite-sericite hydrothermal alteration stage (Ag < 8 wt.%; Palacios et al., 1999b) indicates the vertical position of present day erosion (Fig. 2). Thus, it is possible to infer the remnant ore mineralization potential.

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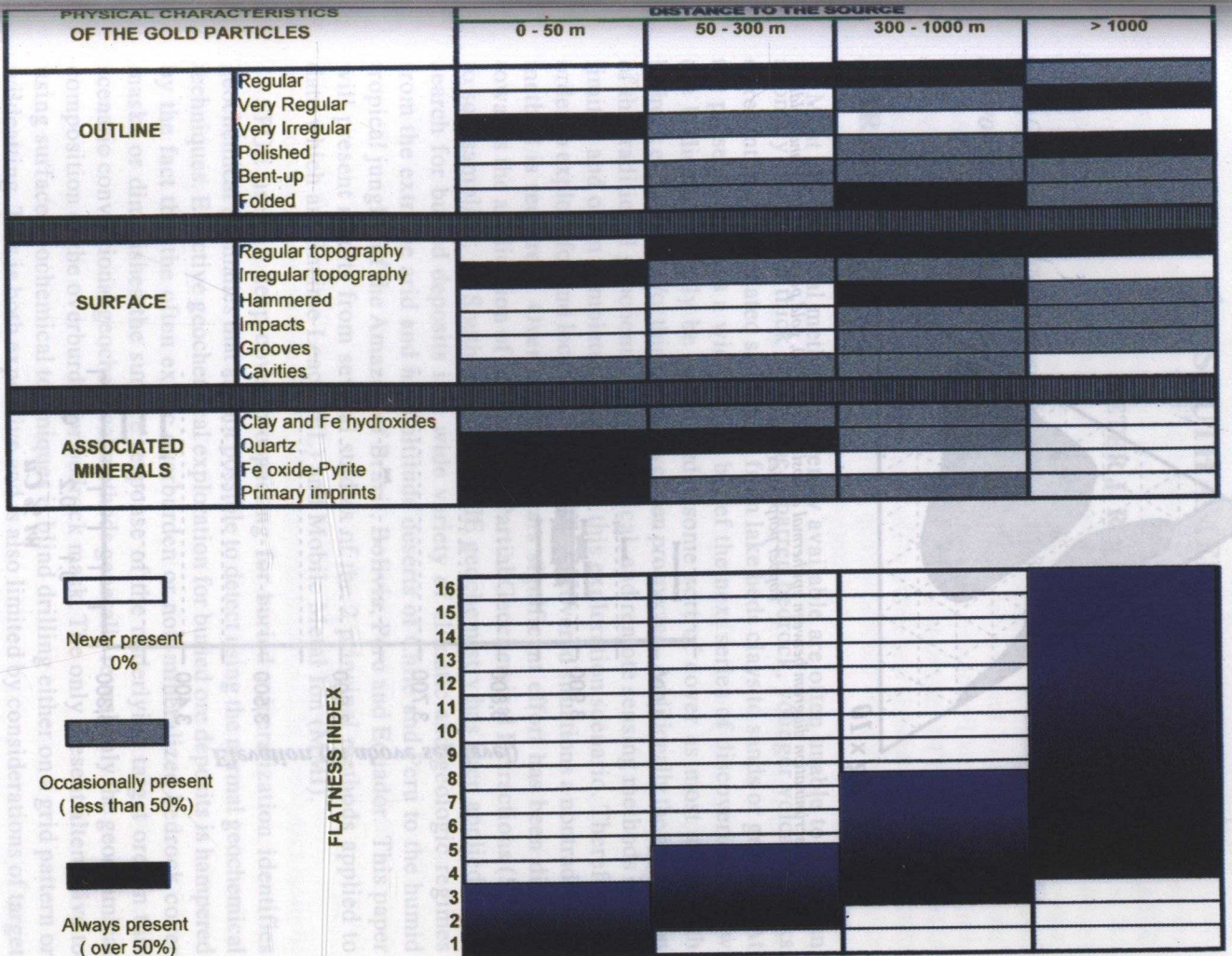
PHYSICAL CHARACTERISTICS OF THE GOLD PARTICLES
DISTANCE TO THE SOURCE
0 - 50 m
50 - 300 m
300 - 1000 m
> 1000
OUTLINE
Regular
Very Regular
Very Irregular
Polished
Bent-up
Folded
SURFACE
Regular topography
Irregular topography
Hammered
Impacts
Grooves
Cavities
ASSOCIATED MINERALS
Clay and Fe hydroxides
Quartz
Fe oxide-Pyrite
Primary imprints
Never present 0%
Occasionally present (less than 50%)
Always present (over 50%)
FLATNESS INDEX
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1

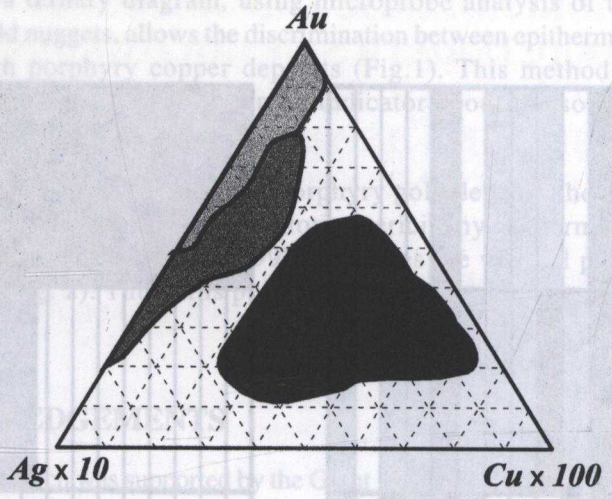

Fig. 1.- Discrimination diagram between epithermal deposits (light grey), gold porphyry (grey), and goldrich copper porphyries (black).

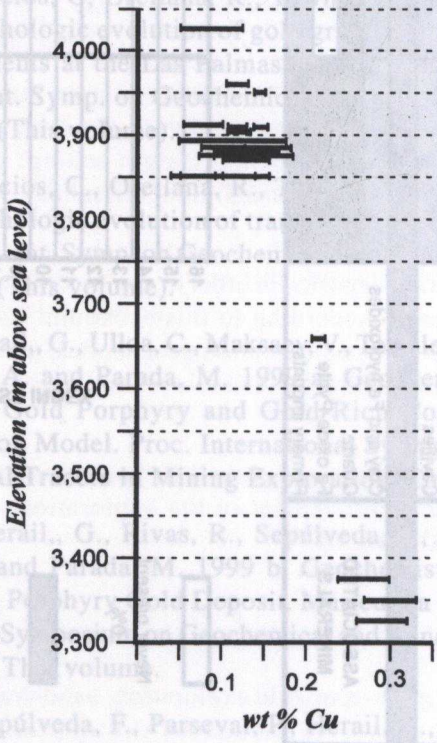

Fig. 2.- Vertical zonation of Cu in gold crystals deposited during chlorite-sericite alteration in gold porphyry mineralization.